

NEW CLAIMS

Applicant has added six new claims to further define the scope of the claimed invention.

New claim 23 is a dependent claim adding additional limitations on the input device of claim 1.

New claim 24 is a dependent claim adding the additional limitation that the finger touch switch of claim 18 is a zero force touch switch.

New claim 25 is a dependent claim adding the additional limitation that the finger touch switch of claim 19 is a zero force touch switch.

New claims 26-28 focus on the adjustment of the beam of light to accommodate variations in finger length as discussed in response to sections 17 & 18. As noted by the Examiner in Section 18, no prior art describes the adjustable placement of the beam of light to allow adjustments to accommodate variations in finger length.

All five new claims are supported by the application as originally filed.

Concluding comments

Assignee has responded to the detailed Office Action authored by the Examiner by modifying and deleting claims in order to expedite allowance of the other claims. Assignee has also provided detail to help the Examiner better understand the differences between the art of record and many of the pending claims. Assignee asks that the claims as pending after this response be allowed to issue.

Respectfully submitted,



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Claims

I claim:

AI Sub B

1. (amended) An input device for receiving an x-y input from a user's thumb having an interphalangeal joint and a thumb tip and input from at least one input actuator on the input device wherein the input device is adapted to allow a user to use the input device while holding the input device in the user's hand with the hand supporting said input device in an neutral open-grip posture with the thumb held erect [pointing forward at the top] and with the thumb generally collinear to a forearm on the same arm containing the user's thumb such that thumb tip can be placed in contact with an x-y actuator such that movement of the thumb tip provides x-y input while the interphalangeal joint of the thumb remains near its neutral, predominantly straightened position without undesirable flexural motion of the thumb.

2. (amended) The input device of claim 1 further comprising a device housing with an input sensor to receive input from the user's thumb such that placement of the user's thumb in a position to provide input causes an interaction between the user's hand and a positioning means [palm fin] portion of the housing that contacts the palm of the user, adapted to interact with the length of a user's thumb such that a user with a large hand and long thumb grasps a first segment of the positioning means [palm fin] and a user with a small hand and short thumb grasps a second segment of the positioning means [palm fin] wherein the height of the palm fin at the midpoint of the second segment is less than the height of the palm fin at the midpoint of the first segment].

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3. (amended) An input device adapted for use by a seated user for receiving an x-y input and input from at least one input actuator on the input device; the input device comprising:

- a) a housing adapted for use independent of any solid surface beyond the user's hand [to fit within the hand of a user while the user's hand is resting on the user's lap];
- b) the housing comprising a main body section with a long axis substantially parallel to a line in the body of a user grasping the pointing device running through the forearm of the user to the tip of the user's extended thumb;
- c) the housing further comprising a platform for containment of an x-y input device, the platform placed to be protruding outward from and substantially perpendicular to and slightly skewed to one side of the long axis of the main body section;
- d) the housing having a channel for placement of the user's index finger;
- e) the housing having a channel for placement of the user's middle finger;
- f) the channels positioned to place the user's index and middle fingers below and substantially orthogonal to the orientation of the user's thumb while the user is grasping the device;
- g) an input actuator being integrally formed into a recessed portion of at least one of the channels; and
- h[g]) an x-y input sensor placed at the end of the input device, distal to the user's wrist, such that the x-y input is provided to the x-y input sensor by [pivotal] movements of the thumb primarily comprised of circumduction of the thumb's basal joint.

4. The input device of claim 3 wherein the x-y input is provided by the thumb tip of the user.

Sus b 5. [cancelled] The input device of claim 4 wherein the x-y input device is curved to approximate the arc of travel of the thumb tip of the thumb during pivotal travel while a user is grasping the input device.

R2 28 b 6. (amended) The input device of claim 3 wherein at least one of the input actuators comprises a zero force touch switch to receive mouse-button inputs.

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7. The input device of claim 6 wherein the zero force touch switch detects contact of the user's finger.

4 8. The input device of claim 6 wherein the zero force touch switch detects the interruption of a beam of light.

AS SUB B
9. (amended) The input device of claim 8 wherein the beam of light travels between an emitter and a detector and further comprising an adjustment means for adjusting the placement of the [beam of light] emitter and detector pair along a path substantially perpendicular with the finger channel to allow adjustment of the activation position of the zero force touch switch to accommodate variations in finger length.

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10. The input device of claim 9 wherein the placement of the beam of light for a zero force touch switch actuated by the user's index finger and the placement of the beam of light for a zero force touch switch actuated by the user's middle finger are both adjusted by a common adjustment means for adjusting the placement of the beams of light.

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11. The input device of claim 8 wherein the placement of the beam of light can be adjusted to accommodate a range of finger lengths via input to an adjustment screw.

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AS SUB B
12. (amended) The input device of claim [3] 4 wherein the x-y input from the user's thumb tip is provided to a touchpad.

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13. (amended) The input device of claim 12 wherein the touchpad may be tilted through use of at least one [a] tilt adjustment screw.

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14. The input device of claim 3 wherein the x-y input from the user's thumb is provided to a track ball.

AS SUB

15. (amended) The input device of claim [3] 4 wherein the device senses the thumb tip at a perimeter input position and communicates to software the user's request for x-y movement of

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the object image under software control until the user's thumb tip ceases to be detected at the perimeter position.

4 16. (amended) The input device of claim 4[15] wherein the x-y input from the user's thumb tip is provided to a touchpad and a set of [the] perimeter input position[s] commands [of the touchpad] are actuated by pressing tactile cursor movement buttons adjacent to the touchpad[so as to reduce accidental input of a perimeter input command].

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12 17. (amended) An input device for a computer comprising an x-y input sensor positioned relevant [related] to the locations on the housing intended for the user's thumb and fingers such that the user can provide[s] x-y input with the thumb tip by [pivotal] movement of the substantially straightened thumb without substantial flexing of the most distal joint in the user's thumb.

16 18. (amended) The input device of claim 17 further comprising:

- 16 a) a scroll-mode select touch switch positioned to be actuated by a movement of the thumb;
- 20 b) a [zero force] finger touch switch positioned at the bottom of a channel intended to receive and support the index finger of the user such that the movement of the index finger tip of a supported channeled index finger actuates the [zero force] touch switch; and
- 24 c) control circuitry to interpret the input from the scroll-mode select touch switch and the [zero force] finger touch switch in the index finger channel wherein the circuitry interprets the activation of the [zero force]finger touch switch after the onset of a maintained activation of the scroll-mode select touch switch as a request for continued scrolling of a displayed image on the computer's image display for as long as both the scroll-mode select touch switch and the [zero force] finger touch switch are activated.

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19. (amended) The input device of claim 17 further comprising:

- 4 a) a scroll-mode select touch switch positioned to be actuated by a movement of the thumb to toggle the operation of the x-y input sensor from a first mode to a second mode;
- 8 b) a [zero force] finger touch switch positioned at the bottom of a channel intended to receive and support the index finger of the user such that the movement of the index finger tip of a supported channeled index finger actuates the [zero force] finger touch switch; and
- 12 c) control circuitry to interpret the input from the scroll-mode select touch switch and the [zero force] finger touch switch in the index finger channel wherein the circuitry interprets the activation of the [zero force] finger touch switch after the scroll-mode select touch switch has been used as a request to toggle the operation of the x-y input sensor from a first mode to a second mode as a request for continued scrolling of a displayed image on the computer's image display for as long as the [zero force] finger touch switch is activated.

16 20. (amended) An input device with a zero force touch switch comprising[:]

- 16 a conductive capacitive sensing plate located in the bottom of a channel contoured to receive a user's finger. [a) a light beam traveling from a light source to a light sensor across a channel, the light source connected to circuitry to detect the presence of an object breaking the light beam in the channel; and
- 20 b) a means for moving the position of the light beam in the channel.]

24 21. (cancelled) The input device of claim 20 wherein the light source and light sensor move within a housing in response to input transmitted from outside the housing.

- 24 22. (cancelled) The input device of claim 20 further comprising a second zero force touch switch with a second light beam traveling from a second light source to a second light sensor across a second channel, wherein a single input transmitted from outside the housing moves the light source and light sensor within the housing and simultaneously moves the second light source and the second light sensor within the housing.

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Subj B

23. (new) The input device of claim 1 further comprising a device housing consisting of a grip-like main body section that is elongated with a curved lower surface that is contoured and partially channeled to accommodate a set of fingers including an index finger from the hand containing the user's thumb while the fingers are in a curved position and wherein the x-y actuator is located at the distal end of the main body section in proximity to the index finger, and the x-y actuator is facing the user's wrist when the input device is held by the user to receive x-y input from the user's thumb tip.

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24. (new) The input device of claim 18 wherein the finger touch switch is a zero force touch switch.

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12 25. (new) The input device of claim 19 wherein the finger touch switch is a zero force touch switch.

16 26. (new) An input device for receiving input from at least one input actuator on the input device; the input device comprising:

20 a) a housing having a channel adapted to receive placement of a user's finger;
 b) an input actuator being integrally formed into a recessed portion the channel, wherein the input actuator detects the interruption of a beam of light between an emitter and a detector; and
 c) an adjustment means for adjusting the placement of the emitter and detector pair along a path substantially perpendicular with the finger channel to allow adjustment of the activation position of the input actuator to accommodate variations in finger length.

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27 (new) The input device of claim 26 wherein the channel is adapted to receive the user's index finger and further comprising:

28 d) a second channel in the housing adapted to receive the user's middle finger; and
 e) a second input actuator being integrally formed into a recessed portion the second channel, wherein the second input actuator detects the interruption of a second beam of light between a second emitter and a second detector;

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- R6
- wherein the adjustment means for adjusting the placement of the emitter and detector pair along a path substantially perpendicular with the finger channel to allow adjustment of the activation position of the input actuator to accommodate variations in index finger length also adjusts the
- 4 placement of the second emitter and the second detector along a path substantially perpendicular with the second finger channel to allow adjustment of the activation position of the second input actuator to accommodate variations in middle finger length.
- 8 28 (new) The input device of claim 26 wherein the placement of the beam of light can be adjusted to accommodate a range of finger lengths via input to an adjustment screw.

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Claims

I claim:

1. An input device for receiving an x-y input from a user's thumb having an interphalangeal joint and a thumb tip and input from at least one input actuator on the input device wherein the input device is adapted to allow a user to use the input device while holding the input device in the user's hand with the hand supporting said input device in a neutral open-grip posture with the thumb held erect and with the thumb generally collinear to a forearm on the same arm containing the user's thumb such that thumb tip can be placed in contact with an x-y actuator such that movement of the thumb tip provides x-y input while the interphalangeal joint of the thumb remains near its neutral, predominantly straightened position without undesirable flexural motion of the thumb.

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2. The input device of claim 1 further comprising a device housing with an input sensor to receive input from the user's thumb such that placement of the user's thumb in a position to provide input causes an interaction between the user's hand and a positioning means portion of the housing that contacts the palm of the user, adapted to interact with the length of a user's thumb such that a user with a large hand and long thumb grasps a first segment of the positioning means and a user with a small hand and short thumb grasps a second segment of the positioning means.

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3. An input device adapted for use by a seated user for receiving an x-y input and input from at least one input actuator on the input device; the input device comprising:

- a) a housing adapted for use independent of any solid surface beyond the user's hand;
- 24 b) the housing comprising a main body section with a long axis substantially parallel to a line in the body of a user grasping the pointing device running through the forearm of the user to the tip of the user's extended thumb;
- c) the housing further comprising a platform for containment of an x-y input device, the platform placed to be protruding outward from and substantially perpendicular to and slightly skewed to one side of the long axis of the main body section;
- 28 d) the housing having a channel for placement of the user's index finger;

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- e) the housing having a channel for placement of the user's middle finger;
- f) the channels positioned to place the user's index and middle fingers below and substantially orthogonal to the orientation of the user's thumb while the user is grasping the device;
- 4 g) an input actuator being integrally formed into a recessed portion of at least one of the channels; and
- 8 h) an x-y input sensor placed at the end of the input device, distal to the user's wrist, such that the x-y input is provided to the x-y input sensor by movements of the thumb primarily comprised of circumduction of the thumb's basal joint.

4. The input device of claim 3 wherein the x-y input is provided by the thumb tip of the user.

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6. The input device of claim 3 wherein at least one of the input actuators comprises a zero force touch switch to receive mouse-button inputs.

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7. The input device of claim 6 wherein the zero force touch switch detects contact of the user's finger.

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8. The input device of claim 6 wherein the zero force touch switch detects the interruption of a beam of light.

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9. The input device of claim 8 wherein the beam of light travels between an emitter and a detector and further comprising an adjustment means for adjusting the placement of emitter and detector pair along a path substantially perpendicular with the finger channel to allow adjustment of the activation position of the zero force touch switch to accommodate variations in finger length.

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10. The input device of claim 9 wherein the placement of the beam of light for a zero force touch switch actuated by the user's index finger and the placement of the beam of light for a zero force touch switch actuated by the user's middle finger are both adjusted by a common adjustment means for adjusting the placement of the beams of light.

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11. The input device of claim 8 wherein the placement of the beam of light can be adjusted to accommodate a range of finger lengths via input to an adjustment screw.

4 12. The input device of claim 4 wherein the x-y input from the user's thumb tip is provided to a touchpad.

8 13. The input device of claim 12 wherein the touchpad may be tilted through use of at least one tilt adjustment screw.

12 14. The input device of claim 3 wherein the x-y input from the user's thumb is provided to a track ball.

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15. The input device of claim 4 wherein the device senses the thumb tip at a perimeter input position and communicates to software the user's request for x-y movement of the object image under software control until the user's thumb tip ceases to be detected at the perimeter position.

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16. The input device of claim 4 wherein the x-y input from the user's thumb tip is provided to a touchpad and a set of perimeter input position commands are actuated by pressing tactile cursor movement buttons adjacent to the touchpad.

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17. An input device for a computer comprising an x-y input sensor positioned relevant to the locations on the housing intended for the user's thumb and fingers such that the user can provide x-y input with the thumb tip by movement of the substantially straightened thumb without substantial flexing of the most distal joint in the user's thumb.

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18. The input device of claim 17 further comprising:

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- a) a scroll-mode select touch switch positioned to be actuated by a movement of the thumb;
- b) a finger touch switch positioned at the bottom of a channel intended to receive and support the index finger of the user such that the movement of the index finger tip of a supported channeled index finger actuates the touch switch; and

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4 c) control circuitry to interpret the input from the scroll-mode select touch switch and the finger touch switch in the index finger channel wherein the circuitry interprets the activation of the finger touch switch after the onset of a maintained activation of the scroll-mode select touch switch as a request for continued scrolling of a displayed image on the computer's image display for as long as both the scroll-mode select touch switch and the finger touch switch are activated.

8 19. The input device of claim 17 further comprising:

12 a) a scroll-mode select touch switch positioned to be actuated by a movement of the thumb to toggle the operation of the x-y input sensor from a first mode to a second mode;
b) a finger touch switch positioned at the bottom of a channel intended to receive and support the index finger of the user such that the movement of the index finger tip of a supported channeled index finger actuates the finger touch switch; and
16 c) control circuitry to interpret the input from the scroll-mode select touch switch and the finger touch switch in the index finger channel wherein the circuitry interprets the activation of the finger touch switch after the scroll-mode select touch switch has been used as a request to toggle the operation of the x-y input sensor from a first mode to a second mode as a request for continued scrolling of a displayed image on the computer's image display for as long as the finger touch switch is activated.

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20. An input device with a zero force touch switch comprising a conductive capacitive sensing plate located in the bottom of a channel contoured to receive a user's finger.

24 23. The input device of claim 1 further comprising a device housing consisting of a grip-like main body section that is elongated with a curved lower surface that is contoured and partially channeled to accommodate a set of fingers including an index finger from the hand containing the user's thumb while the fingers are in a curved position and wherein the x-y actuator is located at the distal end of the main body section in proximity to the index finger, and the x-y actuator is facing the user's wrist when the input device is held by the user to receive x-y input from the user's thumb tip.

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24. The input device of claim 18 wherein the finger touch switch is a zero force touch switch.
25. The input device of claim 19 wherein the finger touch switch is a zero force touch switch.
- 4 26. An input device for receiving input from at least one input actuator on the input device; the input device comprising:
- 8 a) a housing having a channel adapted to receive placement of a user's finger;
- 12 b) an input actuator being integrally formed into a recessed portion the channel, wherein the input actuator detects the interruption of a beam of light between an emitter and a detector; and
- 16 c) an adjustment means for adjusting the placement of the emitter and detector pair along a path substantially perpendicular with the finger channel to allow adjustment of the activation position of the input actuator to accommodate variations in finger length.
- 20 27. The input device of claim 26 wherein the channel is adapted to receive the user's index finger and further comprising:
- d) a second channel in the housing adapted to receive the user's middle finger; and
- e) a second input actuator being integrally formed into a recessed portion the second channel, wherein the second input actuator detects the interruption of a second beam of light between a second emitter and a second detector;
- 24 wherein the adjustment means for adjusting the placement of the emitter and detector pair along a path substantially perpendicular with the finger channel to allow adjustment of the activation position of the input actuator to accommodate variations in index finger length also adjusts the placement of the second emitter and the second detector along a path substantially perpendicular with the second finger channel to allow adjustment of the activation position of the second input actuator to accommodate variations in middle finger length.
- 28 28. The input device of claim 26 wherein the placement of the beam of light can be adjusted to accommodate a range of finger lengths via input to an adjustment screw.